

## **On Performance of Mars In-situ Protocols**

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The landscape of Mars in-situ protocols is quickly developing. The Consultative Committee for Space Data Systems (CCSDS) Proximity Link-1 protocol has garnered support from NASA missions (i.e. Mars '01 orbiter/lander) as well as from international space agencies (i.e. United Kingdom's Beagle II, Centre National d'Etudes Spatiales' (CNES) Netlanders and the European Space Agency's (ESA) Mars Express Orbiter). The CCSDS File Delivery protocol (CFDP) has matured into a Red Book - 3 (the stage immediately before becoming a final Blue Book Recommendation) and is now being considered for use in the new Mars Network mission.

The purpose of using these standard protocols is to enhance interoperability between various space agencies as well as to reduce mission operations costs by automating much of the packet handling and data routing presently undertaken by manual and labor-intensive means. The tradeoff for the reduced costs and operational capabilities is potential degradation in data return (due to packet overhead and protocol coordination).

This presentation will first introduce the purpose and capabilities of two CCSDS protocols: the Proximity Link-1 Protocol and the CCSDS File Delivery Protocol (CFDP). In addition, the presentation will address the quantitative performance trades that occur when using the Proximity Link-1 automatic repeat request (ARQ) scheme, which is an implementation of a standard go-back-N ARQ scheme. Performance of the ARQ scheme is examined while considering the wide range of potential channel characteristics ranging from simple additive white Gaussian noise (AWGN) channels to more bursty fading channels (using a Gilbert-Elliott Markov model).